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ANIMAL KINGDOM

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ANIMAL KINGDOM

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Orienting Ourselves

FOR ABOUT 150 years prior to the beginning of this century an intellectual movement was in progress which in many respects was one of the most revolutionary in all human history. This movement resulted in the creation of an immense structure of knowledge; in effect, the establishment of the biological sciences. It culminated in the pronouncement of Charles Darwin's theory of evolution. The impact of this upon men's minds was far greater than any of us today can realize. Several decades were to pass before its general acceptance. In effect, the Darwinian Theory proved that man was an integral part of nature itself, and not a separate and independent being.

Soon after the commencement of the present century, however, powerful counterforces came into play. They have gone far toward blinding man's eyes to his essential dependence upon nature and have definitely influenced present-day philosophy and our general outlook on life. These counterforces have developed from the extraordinary advances that have been made in the mathematical and physical sciences, which, among other things, have produced innumerable inventions that have enabled man to master the air, to use radar, and even atomic power. As a result, we are apt to be tricked into believing that we are "the masters of the universe" and to overlook, if not forget, our essentiality and oneness with the natural world.

It is curious that the inviolability of the workings of the natural laws should need defenders in this day and age. The human mind throughout the ages has recognized the meaning and power of nature. Lao-Tse wrote in the sixth century before Christ, "Nature . . . makes all things serve her purpose." We can recall Sir Thomas Browne's observation in his *Religio Medici*: "Nature does nothing in vain"; or, Montaigne's words, "Nature can do all and doth all"; he also remarked, "Oh senceless man, who cannot possibly make a worme and yet will make Gods by the dozens"; and Milton, who said, "Accuse not nature! She hath done her part; do thou but thine!"

We all recognize that the word, "nature," is one of the broadest in our language. We can well think of it as referring not merely to the scheme of the universe, but to the sum total of conditions and principles which influence, indeed govern, the existence of all living things – man included. One barely needs to add that animals, in their myriad forms, are dynamic expressions of nature's processes.

In the light of such considerations we can measure the opportunities that lie before our institution.

Fairfield Osborn

IN THIS ISSUE

South American Stone Plover . . . . . *Sam Dunton* COVER
First Prize from the Ecuadorean Andes . . . . . *William Bridges* 3
Five Years of Question House . . . . . *Herbert Knobloch* 8
Counterfeit Terror . . . . . *Edward A. Armstrong* 11
Album Pages: Photographs . . . . . *Sam Dunton* 16
Australia's Yellow-footed Marsupial Mouse . . . . . *David Fleay* 20
Old Fish Do Learn New Tricks . . . . . *Christopher W. Coates* 25
Plants Don't "Balance" An Aquarium 26
News from the Conservation Foundation 27
Behind the Scenes: News and Notes 28

This is the Long-wattled Umbrella Bird, the first specimen (a male) captured by Charles Cordier on the western slope of the Andes in Ecuador. It is a puzzle how the bird can maneuver rapidly in a thick tropical forest with such a cumbersome appendage as this foot-long feathered wattle.

FIRST PRIZE
from the Ecuadorean Andes

By WILLIAM BRIDGES

ONE OF THE CHARACTERISTICS of Charles Cordier, our animal collector, is that when things are going well he doesn't write letters. We have, for instance, never been so well informed about the progress of one of his collecting trips as when he was handicapped by a broken leg in the Belgian Congo.

So it is an auspicious circumstance of his present search for rarities in Ecuador that we have received only three letters from him since he and Mrs. Cordier sailed from New York on October 2. His silence means plenty of hard work and success — but it also means that we have very few details of one of his greatest collecting triumphs. For Charles has captured four specimens of the Long-wattled Umbrella Bird, *Cephalopterus ornatus penduliger,* the most spectacular never-before-exhibited bird in South America.

In the months between the Cordiers' arrival from the Congo on June 15 and the decision to try Ecuador next, Charles and General Curator Crandall systematically studied the bird and mammal possibilities of Central America and northern South America. They settled on Ecuador largely because Charles wanted to make a try for the two Andean forms of the Umbrella Bird that nobody had ever exhibited alive. He had introduced one of the three known forms to the world in 1942 when he brought out the Bare-throated Umbrella Bird, *Cephalopterus ornatus glabricollis,* of Costa Rica and western Panama. Two fine specimens, a male and a female, are living in our Bird House now. Probably his sense of fitness (and certainly Mr. Crandall's curatorial cupidity!) urged that we carry on from the start made in 1942 and be the first to exhibit, individually and simultaneously, all three kinds.

The eastern slope of the Andes, where it drops steeply down to the Amazonian jungle, is the home of one form, the eastern Umbrella Bird, *Cephalopterus ornatus ornatus;* it has quite a wide range that includes western Brazil and the upper Orinoco to the eastern base of the Andes of Colombia and Ecuador, eastern Peru and Bolivia. It has a reasonably imposing wattle, or appendage under the throat, apparently fully covered by feathers, and this wattle is recorded as about 6 inches long.

But the First Prize, the Umbrella Bird that Charles was determined to get — and which he *has* caught — is the Long-wattled Umbrella Bird, *Cephalopterus ornatus penduliger,* of the western side of the Andes in Ecuador and Colombia. Its wattle truly justifies its common name, for it is nearly 14 inches long when extended by the bird's volition — we do not know whether it is extended and contracted by musculature, air or what — and the fleshy appendage is completely covered by overlapping, iridescence-tipped black feathers.

Well, now that he has four specimens of the Long-wattled, at this moment he is ranging the eastern slopes of the mountains in search of the

In 1942 Charles Cordier captured specimens of the Bare-throated Umbrella Bird in Costa Rica and brought them to the Bronx Zoo—the first ever exhibited. This is a pair now on display in the Bird House. The bare throat of the male is bright red and it bears a short fleshy wattle.

only slightly less spectacular eastern Umbrella Bird. Our guess is that he will get it, too.

Only the sketchiest kind of a story of how he caught the Penduliger (Charles uses the subspecific name as a common name), can be extracted from his infrequent letters to General Curator Crandall. Here is his account of the capture of Penduliger No. 1. The letter is dated Quito, Ecuador, November 18.

"Up to now we have one Penduliger which we

The Cordiers lived in a tent while hunting the Umbrella Bird this past fall. Until the rains set in, it was comparatively comfortable, with even a shower bath in the hut at the left.

The expedition's base in Quito is really luxurious, however; there are two buildings in a walled enclosure and the Cordiers live in the smaller house, reserving the large one for animals.

Our last Long-wattled Umbrella Bird was netted in the top of the broad-spreading wild fig tree in the center of this photograph, at a height of 130 feet from the ground. Twenty-four hours later, woodcutters chopped down the tree while clearing the land for a plantation.

brought to our Quito base on November 10 after an all-night drive up the mountain road. Since then I have hurried to make a large cage for it so its foot-long wattle won't suffer. As a matter of fact, the wattle is only about half as long when the bird is at rest.

"Capturing that single specimen has been a mad rush against the oncoming rainy season. The first few days in the foothills were comparatively dry and whenever the sun was shining hard, which did happen every second or third day, the birds would come down from the treetops, occasionally to 50, even 30, feet for a few minutes. At all other times they stay at 150 feet and higher. Observing them was like gaping at the Empire State Building. I had a perennial pain in the neck from staring straight up. Our Penduliger was caught 140 feet in the air.

"If the preposition 'if' had not been invented we would now have at least three Penduliger males, but we simply had to leave that camp because of incessant rain and drizzle lasting sometimes five days without letup. Everything, including ourselves, was getting mouldy.

"One of the specimens we missed fell into my 1941-vintage net made in Costa Rica. He formed a nice pocket, struggled a bit, tore one thread and dropped out again. On another occasion I had a location where two males used to visit once a day for a few minutes to feed on some small fruit of a Passiflora vine. I had the place nicely surrounded by all available nets. As the 'visiting hour' came crawling near I saw my two intended victims in the center of one of the nets studying a Toucanet that had been caught. Never did they come back to the location."

But a little more than a month later, on December 22, Charles was able to report better luck and to give a few details of subsequent captures. His letter accompanied the photographs which illustrate this article.

"One of the pictures (page 6) shows the tree the last Long-wattled Umbrella Bird came out of — a wild fig tree which hours later was cut down as the ground was being cleared for a banana plantation.

"The bird came to that tree at 5:30 P.M., fed, slept in it, drummed with his wings a few times at 5:45 or 5:50 A.M., then boomed for a few minutes, fed, boomed some more and raced back and forth on his favorite branches, displaying his enormous wattle to a visiting female which remained unresponsive to his charms. She made off after a few minutes. By 6:10 A.M. the whole show was off, everything quiet, with no Umbrella Birds in sight. Then at 7 A.M. the woodcutters started on their work nearby.

"The following morning when he darted from his favorite perch to plunk himself down on one about twenty feet distant, he perceived in time a net that had been placed there at my initiative. He had time to make a complete left turn before colliding with the net. After that there were a few tense seconds, or minutes, as you can imagine. Back on his first perch he started to boom as if in anger. He seemed to work himself up into a frenzy. Anyway, on the second jump he forgot all about the net and tore into it with a will, then hung there in a pocket. All this happened at 130 feet."

MRS. CORDIER'S job on collecting trips is to operate the home base and take care of the birds and mammals her husband captures. One letter from her, dated at Quito on December 6, adds a few fragments to the story of Penduliger No. 1.

"The Umbrella Bird, which I named 'Torito,' is lovely now and tame. He is getting a sun bath every day when I move the big cage out into the sun. I have to talk to him constantly so he does not get scared. He starts singing as early as 6 A.M., sometimes in the middle of the night. It sounds like a bull grunting, from far away, but when close I hear first a sound like an electric switch going on; that is when he inhales.

"His wattle, *carleata* as they call it here, gets as long as twelve inches. Sometimes he picks it up in his beak and shakes his head. He has brilliant, intelligent eyes and looks from side to side when I talk to him."

The Cordiers and their Ecuadorean collection will return to New York sometime next May, according to present plans, in time to exhibit the First Prize of the Ecuadorean Andes at the spring Members' Garden Party at the Zoological Park.

FIVE YEARS OF QUESTION HOUSE

By HERBERT KNOBLOCH

When the Question House closed its doors for the winter on November 13 it had completed its fifth year of service to the public and was, therefore, just one-tenth as old as the Zoological Park. It cannot claim to have answered one-tenth of the questions asked about wild animal life or about the Zoological Park in the past fifty years; at best it has been able merely to take some of the pressure off the Zoological Park's animal departments during the busiest seasons.

It is a curious fact that people's appetites for authentic information about animal life is insatiable. The more it is fed the hungrier it becomes. Who answered animal questions before Question House existed? We know, of course, that the Zoological Park has been a clearing house for all sorts of zoological information since its earliest days; over the years the mammal, bird and reptile departments have spent a vast number of hours answering queries by telephone, by mail and by personal interview. Today, although Question House answered 13,316 inquiries in 1949 and a total of 56,754 since it opened its doors five years ago, the stream of questions flowing into the animal departments has not slacked off to any great extent. Those departments do not keep statistics on their questions, so it is impossible to formalize the situation "Before Question House" and "After Question House." Nevertheless, all of us have the impression that the General Curator's telephone rings just about as often and as insistently today as it did before Question House was more than a gleam in President Osborn's eye. Question House, it appears, is simply creating a new demand for information, or perhaps giving an old and unsatisfied demand an outlet by reason of its accessibility in the very center of the Zoo.

Looking back over the past five years there are a few conclusions we can draw about the types of questions that people ask, and about the kind of people who ask them. By and large, the questioners are about evenly divided between adults and children; week-days bring school classes into Question House in droves, holidays and Sundays produce proportionately more adults.

The kind of question that stands out above all others is the summary one: "What is the biggest (or fastest, or strongest or most dangerous) animal?" As everyone knows who has had much experience in answering questions about animals, it is never safe to be dogmatic. The best one can do it is to report the best available records and authenticated observations.

Certainly second in popularity are questions about the care and feeding of wild animal pets. Pets tend to run in fairly familiar channels – squirrels, snakes, tortoises, skunks, frogs, fish, hawks and the like – but still there seem to be a good many problems that their young keepers haven't solved about their diet and living quarters and diseases; we have had to call many times on the animal and veterinary departments for special information when some youngster was faced by an emergency in his home menagerie and put the problem up to Question House. Hamsters and white rabbits and guinea pigs no longer hold many terrors for the Question House staff; it seemed long ago that we had answered *all* the questions about those three animals that could ever conceivably be asked!

Without encouragement, and in truth in the face of all the discouragement we could present, living animals are occasionally brought into Question House for identification. A small boy carrying a shoebox, a glass jar, a tin can or even a sagging handkerchief is pretty likely to be transporting some (to him) mysterious object that Question House is required to identify. The job behind Question House desk is, obviously, no place for anyone squeamish about snakes, spiders, frogs and sick birds! Last year one of our visitors with a "What is it?" question happened to be carrying the larva of a Tiger Swallowtail Butterfly in the exact stage of its development when it was most photogenic; our staff photographer took pictures of the creature, and one of them made an exceptionally striking cover picture for Animal Kingdom.

Veterans have found out about Question House and we get a surprisingly large number of inquiries from men who have more or less definite recollections of creatures they saw in far parts of the world and who would now like to have their recollections checked. We do the best we can, but it is discouraging business when the man knows merely that he saw it in the New Guinea jungles, and can't be sure whether it had hair, feathers *or* scales.

On the theory that Question House's job is to

Question House is a boon to parents baffled by their children's inquiries about animal life and scenes like this are repeated many times a day. Children often seem to have stored up questions from their reading of juvenile books on natural history, and their questions are concrete.

answer questions as honestly and fully as possible, we do not back off from the realm of myth, even though more often than not it is a fruitless and thankless task to attempt to destroy the fantastic untruths that so many people believe. The Question House staff will not soon forget its session with an up-State New Yorker who wanted to know whether we would support his life-long belief that it was dangerous to go swimming in country creeks after the month of May because Copperhead snakes were apt, at that time of the summer, to be rolling on the bottom after shedding their skins. It was easier to convince a boy that "Swamp Rabbits" did not habitually swim on their backs, using their ears as oars — even though his grandfather had told him that tale. On the more difficult side was the reported "fact" that venomous snakes spit out their venom in a ball before drinking, swallowing the poison again when they have slaked their thirst. Sometimes a more enlightened member of the family helps us out — as, for example, in the instance of a man who wanted to know whether a cow would die if she "lost her cud." His wife professed to know nothing at all about cows and cuds, but she had the common sense to point out that if cows lost their cuds and died as frequently as her husband thought they did, the price of milk would be even higher than it is!

ONE THING IS CERTAIN: by far the greater number of questions come from people honestly interested in getting information rather than in "stumping the experts." Nevertheless seriously-asked but unanswerable questions do occur — such as "Exactly where and when did the last Mammoth die?" When a reasonable answer cannot be given, we say so and explain why.

The sources of the inquiries directed at Question House, no less than the timing of questions, follow a predictable pattern. The staple of "off the premises" inquiries — those that come by telephone and mail — stem from newspapers, magazines, radio stations, advertising agencies, authors, artists, doctors, architects; in other words, from professional sources. Periodically there is a spate of questions from crossword puzzle and rebus contest addicts. A picture or article about some queer new animal in the daily newspapers is sure to be reflected over the counter in Question House; dozens or even hundreds of people want to know more about the creature. A major article about a new arrival at the Zoological Park of course brings a vast number of inquiries.

Before the arrival of the Duck-billed Platypuses in 1947 the Elephant was the most popular animal in the Zoo, at least on the basis of the number of inquiries about it. Snakes ran a close second. Now the Platypuses are far in the lead with no fewer than 4,102 questions about them.

Incidentally, the word "Platypus" seems to be a hard one for the American tongue. We have heard the animal referred to as the Flatypus, Patapus, Platybus, Bladypus, Puss, Giant Platy, Palatable Puss, Clatapus, Palabus, Palable Puss, Platyblus, Catapus, Clababus, Platiyepus, Platapazuss, Papoose, Duckless Platypus, Patipus and Pollypus. In conversation they have been called birds, lizards, cats, ducks, fish, crocodiles and alligators. One child wanted to know if they were cats, because the name ended in "puss." When she was informed that they were not cats and that, among other things, they ate worms, she nodded: "Oh, I see — they are chickens!" A much-travelled woman asked the name of the "rare animals" in the exhibit across the road from the Question House. We told her they were Duck-billed Platypuses. "But *they* aren't rare — I used to see them flying over Borneo," she exclaimed. We don't know yet what she thought she used to see "flying over Borneo."

So varied are the questions that come to the desk of Question House that one might conceivably gain a good general education in zoology — at least in popular zoology — by merely standing and listening. Indeed, some visitors do just that; they come in, ask a question themselves, and then stay, fascinated, for half an hour or so to hear other inquiries and the answers.

One thing *we* have learned about in the past five years — the wiles of children. At first we were delighted when a youngster strolled in and with the eager enthusiasm of his age began to fire questions with machine gun rapidity. We congratulated ourselves on this opportunity to help a little mind unfold. Over the years we learned that the thirst for information was not always disinterested. Often we were just an easy way of doing homework!

Counterfeit Terror

By EDWARD A. ARMSTRONG

The author of "Bird Display" makes some observations on the curious phenomenon of injury-simulation in birds.

ALARM a wild duck with her flotilla of ducklings and she may go into a paroxysm of activity, threshing the water with her wings and sprawling about in a helpless way, or disturb a Killdeer Plover from her chipping eggs and she goes fluttering over the ground with one wing waving limply. She may even collapse spread-eagled as if she were at the last gasp. If, however, you approach such an injury-simulating bird it always manages to flutter out of reach, and when you have been led many yards from the eggs or chicks the bird flies up and away.

From very early times such performances have interested and puzzled those who witnessed them. Aristotle called attention to them and probably the remark of the younger Pliny that quail are subject to epileptic fits was based on a misinterpretation of the behavior of injury-simulating birds. The late English Poet Laureate Robert Bridges wrote in *The Testament of Beauty*:

> It is pretty to mark
> a partridge, when she hath first led forth her brood to run
> among the grass-tussocks or hay-stubbles of June,
> if man or beast approach them, how to usurp regard
> she counterfeiteth the terror of a wounded bird
> draggling a broken wing, and noisily enticeth
> or provoketh the foe to follow her in a vain chase;
> nor wil she desist from the ruse of her courage
> to effect her own escape in loud masterful flight,
> until she hav far decoy'd hunter or blundering hoof
> from where she has bid her little ones to scatter and hide.

What is the explanation of this kind of performance, characteristic of birds of many species? Before endeavoring to answer this question it is necessary to consider the circumstances in which it is elicited. It is noteworthy that it is practically confined to birds and is not recorded of any purely aquatic creature, nor is it known among insects or reptiles. A few naturalists, among them W. H. Hudson, have referred to deer making off with a limping gait but it is doubtful whether any such instances can be regarded as injury-simulation or injury-feigning in the sense in which we use these terms of birds. Even among birds there are striking exceptions. They are of special interest as they provide clues to the real nature and function of this form of distraction display. Apart from the Ostrich, such behavior seems to be unknown among flightless birds such as the Penguins and Kiwi and there is no record of a Great Auk acting thus when men approached to take the egg. This suggests that injury-simulation brings the performer into too great jeopardy unless he or she can escape quickly out of reach by becoming air-borne. It might be argued that what matters is rather that the eggs or young should be saved from destruction and that what happens to one of the parents is of secondary importance, but among most species of birds the help of both parents is necessary at some stage in the rearing of the young. If parents acted in a way which rendered them unduly vulnerable the species would be menaced by extermination.

Thus the answer to the question why injury-simulation should be restricted, or almost re-

Photographs Copyright by E. A. Armstrong, St. Mark's Vicarage, Cambridge, England.

The eggs of the Ringed Plover are buffy white or cream with chocolate-colored specks or spots. They are generally laid on sandy, pebbled beaches and blend perfectly with the ground.

stricted, to birds, is that they are the only considerable group of organisms in which parents are likely to be near their offspring to deal with the situation when predators approach, and these same parents possess, in most cases, a capacity for escape into another element. One would not expect to find injury-simulation behavior among bats, for instance, because they carry their young with them, nor among flying fish, for they would not thereby protect their progeny, and there are usually obvious reasons why it should not occur among any of the relatively few insects in which there is some approximation to parental care, such as earwigs or hive bees.

Examining the situation further we find that injury-simulation is extremely rare among species nesting in lofty trees but it is common and often highly realistic among birds breeding in very open situations — such species as the Killdeer in North America, the Dotterel, Golden and Ringed Plovers in Europe and the Banded Dotterel in New Zealand. This can mean only one thing—the elimination by predators of inefficient performers and their offspring has operated so that injury-simulation has been brought to a high degree of realism among species much exposed to the attack of ground enemies.

A further qualification may be made. Although injury-simulation is widespread among birds it is uncommon among species which nest in closely-packed colonies. For instance, murres, gulls and terns do not show this form of behavior. There are exceptions, such as pratincoles and avocets, some species of stilt, and black skimmers. These birds are rather exceptional in their feeding behavior and one suspects that their community nesting may be a comparatively recent development, as time is reckoned in evolution, and the birds have not yet discarded a type of behavior which has much less survival value in crowded colonies than when performed by birds nesting in isolation. A small mammal having found his way among numerous nests is not likely to be lured away by the antics of several frantic birds

sprawling or fluttering near at hand. As is well known, birds nesting in close colonies rely on mobbing to drive away or distract the attention of enemies rather than on injury-simulation.

Thus from one point of view we may say that this form of display is the outcome of natural selection, but we must now ask how it is to be explained on the basis of our present knowledge of bird psychology. An observer who has not studied bird behavior closely is apt to think when he sees the very realistic performance of a Killdeer or Golden Plover that the imitation of injury or incapacity is deliberate and therefore due to "intelligence." But when we see a stick insect mimicking a twig we do not consider the creature "clever." We realize that the adaptation has come about through the elimination of individuals which were too conspicuous. In short, the adaptations of bird and insect are due to natural selection. It is possible, indeed, to demonstrate the unintelligent nature of the injury-simulation of a bird such as the Ringed Plover. One may frighten it again and again. Each time it will limp and flutter away as if crippled, and then, suddenly give itself a shake and walk back to brood its eggs within a foot or two of one's face. Indeed, I have known a bird after injury-feigning to allow me to put my fingers under its breast.

Such behavior in which the impulse to flee and and the impulse to brood alternately dominate suggests that injury-simulation behavior is a product of the clash of the two incompatible impulses. This theory, however, only takes us a short distance in explaining the evolution of these remarkable performances, but if we enquire what happens in other circumstances when there is a conflict of impulses or an impulse is thwarted we gain light on our problem. In such a situation a bird usually performs some irrelevant action; a gesture or item of behavior from one type of situation is performed incongruously in quite another type of situation. I have suggested that such items of behavior or "behavior-patterns" performed "out of context" should be called "displacement activities," as they are activities transposed from their normal setting. Thus a thwarted house sparrow wipes its bill and a mouse unable to escape from a cage will clean itself. Now, it is in situations when a bird is frightened at the nest or prevented from brooding that such activities are commonly performed. In interludes between injury-simulation a Ringed Plover will preen, peck at the ground as if feeding, but without seizing anything, or settle as if brooding in a hollow among the pebbles. The fact that such displacement activities are so often associated with injury-simulation raises the question, "Is this form of behavior also a displacement activity?" As it is never enacted except in this type of situation it is obviously not transposed from another context and it would seem that the answer must be in the negative. But there is another explanation which I believe may be the solution of our problem. I suggest that injury-simulation displays have incorporated movement patterns from other contexts, such as threat behavior or courtship — varying, of course, according to the species. Thus nighthawks open wide their huge gapes while simulating injury, behavior which is essentially threat display. The Killdeer's injury-simulation display appears to be a modification of the threat attitude in which the bird partly spreads its

Here the female Ringed Plover is settling down on her nest on the beach while the male stands guard a short distance away.

The Ringed Plover sometimes performs a threat display before an injury-simulation.

The bird has left the nest and is about to "injury feign" with an attitude like threat.

The female simulates injury; she creeps from the nest with her wing flopping as if broken.

wings, flexed with the upper surface toward the intruder. This plover, and several other species of plover, spread the tail during threat or courtship display and also in their distraction display. Thus it seems that injury-simulation incorporates forms of display displaced and modified from other situations.

This theory might seem far-fetched but that we know that this is exactly what has happened with other forms of display. The Gray Heron's display, signifying that he is ready to welcome a female to his territory among the branches, is a modified form of the gesture he makes in catching food. The pigeon, and some other birds, make preening motions during courtship, and various species of duck have incorporated a drinking gesture into their sexual display, as Konrad Lorenz has demonstrated. Thus we know that displacement activities may become stereotyped in their new behavior context and become innate forms of display behavior. Probably injury-simulation owes its evolution similarly to modifications of items of behavior from other contexts.

Field naturalists will find it worth while to scrutinize any injury-simulating birds they happen to come across with these possibilities in mind. I believe that the more closely these displays are studied the more clearly it will appear that they incorporate activities from other behavior contexts.

This female Ringed Plover is putting on a good act as an injured bird. Flushed from her nest, she hobbles and limps away with one wing being waved conspicuously and the other held as if broken. Photographs such as this are extremely difficult to obtain and few have been made that are as fully illustrative of the various threat display and injury-simulation actions as these. Photos by the author.

Although females of most birds are especially famous for the injury-simulation act, here it is the male Ringed Plover that is crouching in the open near the nest, as if to brood or hide.

Derby's Woolly Opossum posed rather unconventionally for this photograph, with its tail in a rakish attitude across its head. This little animal comes from Peru and Ecuador northward to Central America. Its normally pink ears turn a rose color when it is annoyed or gets excited.

Album Pages

Photographs by Sam Dunton

A very rare bird is the Double-banded Giant Cacique of northeastern Brazil—so rare that only once before has it been exhibited. That was in 1915-1933 when a specimen lived in our collection. It is a forest bird, related to the Montezuma Giant Cacique, largest of all the Orioles.

The graceful and sure-footed motions of a pair of Squirrel Monkeys from South America are revealed by this photograph taken at high speed by a stroboscopic light. In their large compartment in our Small Mammal House, as in the wild, they seem to be constantly making flying leaps.

"Princeton" is the largest of the three cubs born to "Dacca," our superb Tiger mother, on May 6, 1949. He was just five months old when this portrait was made and about three weeks later he weighed 89 pounds. All three of the young Tigers are friendly and good-natured.

Usually the only time it is possible to photograph a Yellow-footed Marsupial Mouse is when the female is hampered in her movements by her babies. These "joeys" were about 8 weeks old.

Australia's Yellow-footed Marsupial Mouse

By DAVID FLEAY

IN TIMES that are now long gone I camped one autumn night with a cobber in the tin-roofed, hessian-sided store hut of a bush apiary. It was the only structure for miles on the "Stony Rises" property of Mr. Jim Anderson, between Smeaton and Campbelltown, central Victoria, Australia, and stood among outcropping masses of basalt and spreading, yellow box eucalypts. Our aim was the capture of a Brush-tailed Tuan, that handsome, alert and dashing marsupial hunter — a specimen of which had been in the habit of burgling the hut for honey.

The "Bee bloke" — as our absent host was familiarly known in the district — had gone to great lengths to make his storehouse proof against pilfering by furry bandits, and the only light penetrating the interior came through a narrow strip of fly screen encircling the hut immediately under the roof. However there was a newly broken hole in this band, with clinging tell-tale hairs.

Throughout the night we dozed and watched but the darkness passed and it seemed that the vigil had been in vain. Suddenly, in the dim gray light of dawn, a sharp-nosed, wide-eared face appeared on the outside of the screen, and with characteristic quick, jerky movements there entered the hut through the obviously familiar

All photographs from David Fleay, Badger Creek, Healesville, Victoria, Australia.

entrance hole not our long-expected Tuan – but a Yellow-footed Bush Mouse, one of its smaller and very handsome relatives. This first sight of an animal new to us was the signal for a quick plugging of the hole and the start of a lively chase. Ten minutes later, however, we gazed in despair at a mass of overturned boxes, tins and spare hives in which there was not the slightest sign of our visitor. Following several lightning-like journeys 'round the bag walls of the hut, the little marsupial had departed even more suddenly than it had come. Nevertheless, some days later we caught "him" in a curious and totally unexpected manner. It turned out that he and a fellow "mouse" were dwelling in an empty hive near the hut. They gave themselves away by characteristic quarreling notes of "chit – chit – chit – chit" such as we hear today from Swainson's Pouched Mice living in the walls of our bush home at Badger Creek, and all we had to do was to push a large cork into the front "doorway."

The first bush "mouse" of this genus that I ever met joined my collection under much more unusual circumstances. It was a very hot day, and wandering through the bush near Ballarat I came to a curious little hollow tree on the crest of a long, low range. Down a deep crack in the trunk the dim, quickly-breathing form of a mouse-like creature could be seen, but how to reach it in the absence of a hatchet was a difficult problem. Suddenly I had the bright idea of making use of a Copper-head Snake which had been bagged several hours earlier. The reptile was introduced head first into the hole and suspended by the tail. Though this occurred 26 years ago I can still picture the amazing activity of the frightened Swainson's "mouse" as it shot from the nest and spiralled round the trunk, eventually being secured by a lucky grab!

Among the lesser pouched animals the Yellow-footed Pouched Mouse (*Antechinus flavipes*) is practically unknown to the ordinary observer, but it merits interest and admiration because of its keen, alert bearing, warm russet-colored fur, amazing rapidity of movement and unique zoological standing.

With male specimens attaining the size of a half-grown rat, i.e., up to 8 inches in length from nose to tail tip, and females from half to three-quarters the size of the more robust sex, this representative of the broad-footed pouched mice is remarkably variable in measurement. It is a sharp-nosed, keen-scented seeker of insects, nectar, small birds, little lizards and particularly of

A close relative of the "Yellow-foot" is Swainson's Pouched Mouse, smaller and more chocolate or reddish in color. The rain forests of southern Victoria and Tasmania are its habitat.

common mice, wherever it can find them. Skins of these rodent pests are usually so thoroughly cleaned up that the peeled skin is left turned inside out.

Whereas the smaller chocolate or reddish brown Swainson's Pouched Mouse (*A. swainsonii*) favors the rain forests of southern Victoria and Tasmania, the yellow-footed species takes over among sparsely timbered granite ranges or basalt country north of the divide in Victoria. It also favors the sandy box ridges of Murray river areas, the Sydney sandstone outcrops, and ranges widely over mainland Australia. In secluded hollow limbs, or hidden rock crannies in such habitats, it builds a large nest of eucalypt leaves arranged in a circular manner and packed neatly on the long edges, like cards, to enclose a central cup-shaped resting place.

With such a wide range over mainland Australia, though not occurring in Tasmania or New Guinea, it is scarcely surprising to find that its general color is, like its size, somewhat variable. Apart from the typical species a North Queensland, a South Australian and a West Australian race are recognized. In all of them the buff or yellowish tone of the broad feet is fairly constant. Victorian examples are of a general warm gray suffused with yellow above, with head and neck conspicuously gray. The ventral surface is yellowish to rufous, feet yellow, with sides of body rufous or a golden tan. The tail, which is shorter than the combined head and body, is covered uniformly with close stiff hair, rufous below and colored above like the dorsal body surface. With the typical widely-opening jaws of a predatory mammal, and dentition resembling on a small scale that of its relative, the native cat (Dasyure), the Yellow-foot is capable of vigorous biting, and male specimens draw blood readily if unwisely handled. The ridged foot pads and long claws, which assist them to climb so agilely about trees and rocky places, also enable the animals to run practically upside down over the roofs of rock caverns.

Particular attention has been directed to the Yellow-footed Marsupial Mouse by Professor Wood-Jones who pointed out that its special interest from a zoological point of view lies in its representation of a marsupial base form. In the whole of its anatomy it shows itself to be a remarkably generalized animal, but little modified from a basal mammalian plan that could be considered ancestral to most of the marsupial radiations that gave us the hopping, climbing, parachuting, digging, hunting and even aquatic forms. It is unfortunate indeed that the Yellow-footed Bush Mouse is such a simple, trusting creature, lacking any great degree of cunning or proper appreciation of danger, for as a destroyer of cockroaches and other harmful insects it has few equals. It becomes too intent on hunting activities in the presence of prey, and I well remember an early dawn in the Daylesford district of Victoria, when, hearing a commotion among roosting sparrows and observing fluttering wings in roof guttering, I reached up and pulled down a sparrow with a Yellow-footed Mouse attached. Oblivious to all else, the attacker persisted in its bulldog grip even when I carried it away! It is not difficult to lure the animals into box traps baited with honey-soaked bread or pieces of meat while watching from nearby.

Domestic cats and the common fox have been responsible for clearing the Yellow-footed Bush Mouse from many of its former haunts and it is unfortunately true that wherever settlements spread, the doom of this little animal and others like it appears to be merely a matter of time — unless, of course, netted-in areas are established in suitable country, with sufficient staff to control marauders. In a few short years I have noted its final disappearance from areas where formerly it was possible to watch it running, a few feet at a time, along sun bleached logs, stopping with a characteristic jerk and as quickly moving sideways or forward, or circling a tree trunk in its inimitable style. Nocturnal and crepuscular, Bush Mice often investigated our camps and in the dusk or very early morning it was no uncommon thing to see the hind-quarters and tail of a busy Yellow-foot projecting from an open jam tin among the scattered provisions.

The method of carrying and caring for young is of exceptional interest, for, following the general rule that the smaller the marsupial the greater the size of its brood, the Yellow-foot in Victoria, at least, takes the palm for large families; and though textbooks indicate the maximum

These "Yellow-foot" babies are about 8 weeks old and have attained considerable size. At birth they are only a fifth of an inch long; they leave the "pouch" area after some 35 days.

number of teats in the pouch as ten, I have counted the total in various individuals caught as 8, 10, 11 and even 12! Thus the number of young carried at a time is distinctly variable and it seems that there are more "joeys" born than there are teats to accommodate them — with a resulting survival of those first at the "post." Indistinguishable in its off season resting condition from the rest of the ventral surface, the pouch cannot truthfully be referred to as such, for it is not an enclosed pocket as in the narrow-footed Pouched Mice (*Sminthopsis*) and is therefore merely a pouch area. In the northern Victoria range of this species, this skin area usually begins its seasonal development in early August with shallow skin folds appearing longitudinally on each side and longish white hairs growing from the anterior edge and to a lesser extent on each side so that they give a certain amount of protection later on to the otherwise completely exposed young. Within the pouch area itself there appears a growth of reddish or rusty hairs. The mammae become evident as red pointed dots. From experiences in breeding these marsupials in captivity and from observations while catching them in box traps in the Broadford, Tallarock area, Victoria, it appears that the time of birth is usually quite regularly mid-August, and that the females get away by themselves.

Newly born "joeys" are about a fifth of an inch in total length, pink in color and scarcely visible in the long white hairs that project from the fore part of the pouch. The tiny, naked offspring grow fairly rapidly but are inseparably attached to the teats from which they depend for some 35 days. As the climax of this period approaches the unfortunate mother is fearfully hampered in her activities, for the young are like so many cocktail sausages clustered about her abdomen, and it is understandable that, being so handicapped, her condition becomes poor and she is an easy mark for natural enemies. However, at the end of the 35-day period the young are capable of relinquishing their hitherto unbroken grip of the individual mammae and then they drink at will. Nevertheless for most of the daytime in the two ensuing weeks they still grip tightly and present an amazing spectacle as they squirm en masse. Towards evening the mother gently shakes or vibrates her abdomen to persuade the youngsters to lie loose in the nest. Then free as the wind (comparatively), she may skip about the bush, the rocks, curled bark and fallen logs seeking food.

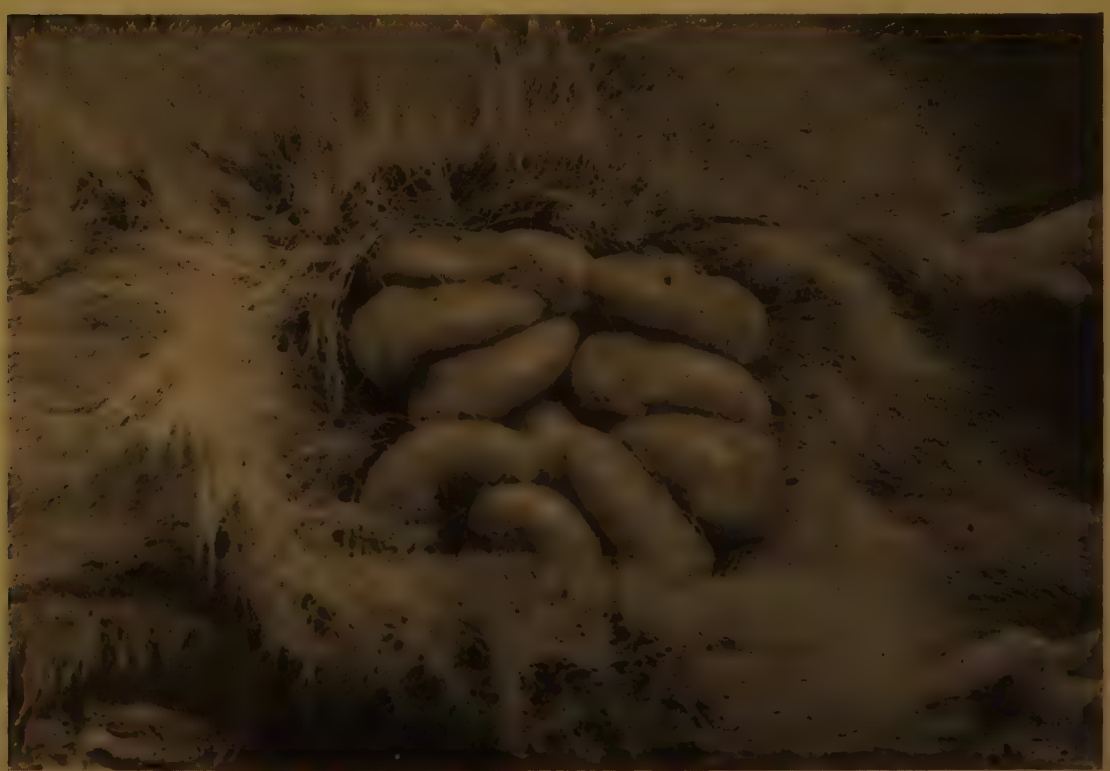
It is almost impossible to photograph the Yel-

low-footed Bush Mouse on account of its swift movements. The best opportunity comes when the mother is loaded with large "stick-fast" young. In fact, should one of the bunch become detached and cry "Siss — siss — siss," she endeavors to stay put long enough for the temporarily unseated youngster to again climb on the overloaded bandwagon.

At the first sign of partial independence the babies, whose eyes are still closed, are most fully developed at the head end, both as to size and the faint covering of thin fur. Their eyes open within a few days of nest-resting; fur quickly becomes thicker, spreading posteriorly over the whole body, and if lifted from the nest during daylight each infant utters the repeated sibilant cry of "Siss — siss — siss!" until seizure of the mother's fur or teats in strong little jaws and forefeet lulls further anxiety in the comforting sense of security.

At three and a half months the now active, sharp featured and streamlined little fellows make excursions of their own, having become practically independent of the faithful mother. They have never seen their father and it is sad to report that if he encountered his children in their tenderer stages alone and unprotected, he would become a cannibal in the worst sense of the word.

To see a Bush Mouse family complete with mother — a mass of black-eyed, sharp-nosed, alert faces peering at one from the gum leaf nest — is a unique and fascinating sight. Such families are very noisy, indulging in mock quarrels with much sibilant hissing. Young Bush Mice of this species are even more foolhardy and venturesome than the adults, and about the month of December many come to untimely ends by ill-judged leaps into half-empty honey tins in bush apiaries, diurnal scampering in full view of watchful Kookaburras, or by presenting themselves to the pitiless attentions of cats, both wild and domestic.



A close-up photograph of the pouch area of a Yellow-footed Marsupial Mouse shows how apt is Mr. Fleay's description of the babies as "cocktail sausages." These youngsters were 18 days old, still pink and hairless, and are reproduced here at about two times their actual size.

Three inches off the floor of its tank, comfortably nestled in a growth of Amazonian Sword-plant, one of the 18-inch Knife Fish takes a nap. Other fishes in the tank do not disturb it.

Old Fish Do Learn New Tricks

By CHRISTOPHER W. COATES

EVERY ANIMAL COLLECTOR and animal keeper recognizes and uses as a matter of course the amazing ability of wild-caught creatures to adjust themselves in an astonishing degree to the ways of captivity. Even the casual visitor to a zoo, for instance, cannot fail to notice that newly-captured elephants soon learn to reach for peanuts offered them by their visitors.

Almost all animals in captivity must make dietary adjustments. Less obvious to the visitor, but of equal importance to the keepers, is the final settling down of the animal to acceptance of the limits of its enclosure. The Zoological Park's Mammal Department is always concerned when it turns zebras out into wire-enclosed ranges, for they may run right into the fence. In the Aquarium we must make sure that sharks, for example, recognize that they can't go sailing through a concrete wall and in their attempts to do so shatter their skulls. It is not difficult, once the keeper of such animals knows what they might do, to arrange that they don't do dangerous acts the first time they have the chance; thereafter the animals of their own accord learn not to do them.

Such matters are reasonably obvious to everyone who has anything to do with wild animals and they indicate that the animals all have some definite ability to learn things entirely foreign to their old ways of life, in very short order.

About two months ago we received two specimens of *Gymnorhamphichthys hypostomus* Ellis, one of the gymnotid eels popularly known as Knife Fishes, from the British Guiana-Brazil border. These extremely compressed fish resemble a slender knife blade about eighteen inches long. They have a rather long snout with a very small mouth and are without teeth, thus being unable to protect themselves against enemies by fighting.

They have a few scales but no armor of any sort. Neither are they fast or agile in the water. All of which is to say that they do not seem particularly well adapted to survival in a rough world. They are quite rare in collections; in fact we doubt if more than one hundred have ever been caught by any collectors other than natives who might poison a stream for food fishes. It might be thought that they are quite rare in their own waters, if it were not that an intensive search does turn up a number at a time. Our specimens are quite large and thus are probably old.

A clue to their apparent rarity is offered in their initial behavior in the Aquarium's tanks. When they were first brought in they immediately burrowed into the sand at the bottom of the water and remained there, going in so carefully that not even a low pile of sand marked their location. They did not even disturb the roots of plants in the heavily-planted tank and with these two fish, as with some others we received in 1934,[1] the tank always looked empty during the daytime, so that our tankmen often thought the fish had somehow managed to escape.

This burrowing into the sand during the day-

(*Continued on Page* 30)

Plants Don't "Balance" An Aquarium—But the Myth Dies Hard

About twenty years ago Dr. Charles M. Breder, Jr., at that time Research Associate at the old New York Aquarium at the Battery, got interested in the chemistry of standing aquaria; he wondered what was happening to the water — and the fish — in small tanks of the kind that are often found in homes.

One of the things that everybody "knows" about home aquaria is that aquatic plants "balance" them and maintain an equilibrium of oxygen for the fishes.

Dr. Breder found that that wasn't so at all. Plants do *not* oxygenate the water in fish tanks; the oxygen so necessary to the fish is absorbed by the water from the atmosphere. The "limiting factor" in such tanks is an excess of carbon dioxide, rather than a lack of oxygen. As far as respiration is concerned, fish do just as well in tanks without plants as with them!

This was a rather revolutionary finding, but Dr. Breder published it casually in 1931 as a small note in *Copeia,* the journal of the American Association of Ichthyologists and Herpetologists. He was more interested in theoretical concepts than in the practical application of his work to the keeping of fishes in the home.

Other members of the Aquarium staff, in more direct contact with fish hobbyists, made use of Dr. Breder's research, however, and off and on for the past twenty years Curator-Aquarist Coates of the Aquarium has written about the plant-fish relationship and talked about it to aquarists who asked his advice about setting up small tanks at home.

Recently Assistant Curator Atz has taken up the fight to correct the popular, but wrong, impression. A year ago he published an article, "The Myth of the Balanced Aquarium," in *Natural History.* It was so closely reasoned and so buttressed with documentation that it was reprinted this winter in extended form by *The Aquarist and Pondkeeper,* a British journal. Subsequently *Veterinary Excerpts,* a trade journal for veterinarians, digested the article — although warning its veterinarian readers that their clients might not believe the true facts, because of the ingrained nature of the popular belief.

Mr. Atz is carrying on his campaign to set aquarium-keepers straight about the actual functions of plants in home aquaria by a further article in a forthcoming issue of *The Aquarium Journal* and an article on "What Not to Teach About a 'Balanced' Aquarium" in *The American Biology Teacher.*

But myths die hard and a good proportion of the correspondence the Aquarium has had in recent weeks from fish-keepers is decidedly disbelieving. On the other hand, one newspaper columnist accepted Mr. Atz's statements so wholeheartedly that he warned his readers against keeping plants in their aquaria, saying they were dangerous to the fish!

News from the Conservation Foundation

Yale Is Breaking New Ground

On January 16 the Yale University News Bureau released the following statement — obviously of extreme interest to every member of the New York Zoological Society:

New Haven, Conn., January 16 — Yale University in cooperation with The Conservation Foundation is establishing the country's first graduate program of research and instruction in conservation of natural resources.

The courses will begin September, 1950, and one of the leading educators and authorities in the field, Paul B. Sears, will be in charge of the Yale program with the rank of Professor of Conservation, a newly-created post.

Professor Sears is now at Oberlin College, but will leave to join the Yale faculty next summer.

The course in conservation will be for graduate students only, although it is hoped that a similar program for undergraduates will be established in the future. The graduate course will require two years of study and research, and will lead to the degree of Master of Science in Conservation, the first time such a degree is to be awarded in this country.

The program will be administered by the Division of Sciences and the Graduate School. "The time has come when the whole field of conservation is so important that the training of competent personnel is a problem for our universities," Edmund W. Sinnott, Director of the Division of Sciences, said in announcing the new Yale program.

The Conservation Foundation, which was founded in 1948 with headquarters in New York, "to promote conservation of the earth's life-supporting resources," has given its support and cooperation to the Yale program. Fairfield Osborn, President of the Foundation, stated that "This should prove a step of extraordinary importance in the development of the Conservation movement in our country. The Foundation is glad to enter with Yale into this program that will provide greatly needed Conservation man-power trained at the highest educational level.

"We believe," he said, "that the course taken by Yale will be followed by other universities and colleges throughout the nation."

The inauguration of the Yale program indicates the growing interest of educators in problems of conservation, according to Professor Sinnott.

"Experts are agreed that unless steps are taken to check soil erosion, to cut down the waste of forest reserves, and to conserve other resources, there will be tragic implications for human life," he said. "Serious problems of sociology and economics are involved as well as the whole question of man's stewardship of the earth's resources."

The bulk of present-day conservation work is carried out by the government, he pointed out, but emphasized that there is a need for independent groups to evaluate and initiate conservation procedures and to serve as advisors to government agencies.

Training men at Yale for the professional field of conservation will help supply personnel for such independent groups, he said. Professor Sinnott also explained that there is a growing demand from industry and government, both here and abroad, for men who have been trained in conservation.

Professor Paul B. Sears, in directing the Yale program, will himself teach two graduate courses — General Ecology and the Ecological Basis of Human Society. In addition, the students will take many of the regular Yale courses already in the University curriculum bearing upon conservation. Some of these are Plant and Animal Ecology, Geology of Soils, Oceanography, Biogeo-chemistry, Forestry and Microbiology.

(*Continued on Page* 28)

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

Paper by Jocelyn Crane Gets Morrison Prize Mention

A technical paper by Miss Jocelyn Crane, research associate of the Department of Tropical Research, was given honorable mention in The A. Cressy Morrison Prize Competition in Natural Science of the New York Academy of Science in December. Her paper was entitled: "Comparative Biology of Salticid Spiders at Rancho Grande, Venezuela. Part IV. An Analysis of Display."

Twelve papers were submitted in the competition and the two awards of $200 each were made to Dr. Abraham Slavin for a paper on "Stability Studies of Structural Frames" and to Harold R. Hagan for "Embryology of the Viviparous Insects."

Miss Crane's paper has been published in *Zoologica,* Part 4, 1949.

Taking the Census

Although presumably accurate monthly counts of all specimens of live animals are made by the Mammal, Bird and Reptile Departments, the utmost pains to arrive at an exact count are taken at the end of the year. The December 31, 1949, census will probably show increases in species and specimens in all three departments. This year, as occasionally in the past, two mammals will be listed that no one has yet seen — Agile and Bennett's Wallabies that are still in their mothers' pouches. The Peafowl population is up; three broods, of a total of 12 birds, were reared this past year while at liberty in the Zoo.

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The In-Service Course for Teachers, on how to use the facilities of the Zoological Park to greatest advantage, concluded its series of 15 hour-and-a-half sessions in the Zoo on January 10. Forty-five teachers completed the course, and because of the heavy registration demand last fall it will be repeated in the spring.

Conservation Notes

(*Continued from Page* 27)

Actually, a considerable part of the Yale program will be centered upon study and research in the field. The Connecticut River Valley, which has been described as an outstanding example of both good and bad conservation practices, will serve as the outdoor "classroom" for the students.

Water Crisis Long Foreseen

BY GREAT GOOD FORTUNE, one of The Conservation Foundation's most active research projects is developing information on a problem which has attracted a high degree of interest in recent months.

For a period of approximately two years the Foundation's staff investigated water resources problems in order to determine what information was lacking to achieve a full understanding of how conservation practices might be applied to assure continued supplies of water where they are needed. As a result, last July with the financial backing of The Rockefeller Foundation, we initiated a year's study of ground water shortage problem areas in order to classify and describe these and to find out how changes in this vital resource might be avoided and corrected.

Although the current New York City shortage is not a ground water shortage, it does point up vividly the urgency of water problems in this region and in others. Too often the apparent constant availability of water at an inordinately low price lulls people into unawareness which in turn

Our new Okapi, brought from the Belgian Congo by Charles Cordier last June, has settled down to a placid and healthy existence in the Antelope House. The animal was captured during the winter of 1948-9 in the equatorial forest near the village of Bilota, in the eastern Congo.

results in lack of careful planning. To date we have found a number of individual communities which are hard pressed for ground water for domestic, industrial and agricultural use. A classification of these by rate of use will enable us to project possible future growth and future control in order to provide sustained yield from these sources. For the first time a complete picture of ground water problems will be available from the point of view of actual use rather than from geological origin. Further analysis is necessary in the coming six months in order to indicate the specific nature of the results. However, by the simplest possible calculations we see that although there are water shortages which occur in only about one per cent. of the country's land area, the population affected by this is something over twenty-five per cent. of the nation's people. Therefore, these shortages not only mean something to the individuals immediately concerned, but also mean even more to business and industry outside of these areas who either serve or depend on these shortage communities.

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New Light for the Aquarium's Tanks

One of the difficult problems of exhibiting fishes and other underwater creatures is that of providing the proper light for them. Curator-

Aquarist Coates has experimented with various lighting systems for many years, improving the illumination of the tanks of the Aquarium. Recently a new type of fluorescent tube has become available that has proved the best of all artificial lights for aquaria.

Although fluorescent lights have always presented the advantages of a large, uniform source of light, small production of heat and low consumption of electricity, the older types were quite unsatisfactory for aquaria. They gave an extremely "cold" light – as if the tank were illuminated by moonlight – and destroyed the vivid reds and warm oranges and yellows that play so important a part in the coloration of fishes. The new fluorescents, aptly called Warm Tint and Warm White, do not produce this unnatural effect. Moreover, aquatic plants seem to thrive under them. Better growth of aquatics than ever before has been obtained by using these new tubes in the Aquarium's 300-gallon tanks that contain 30 or more inches of water.

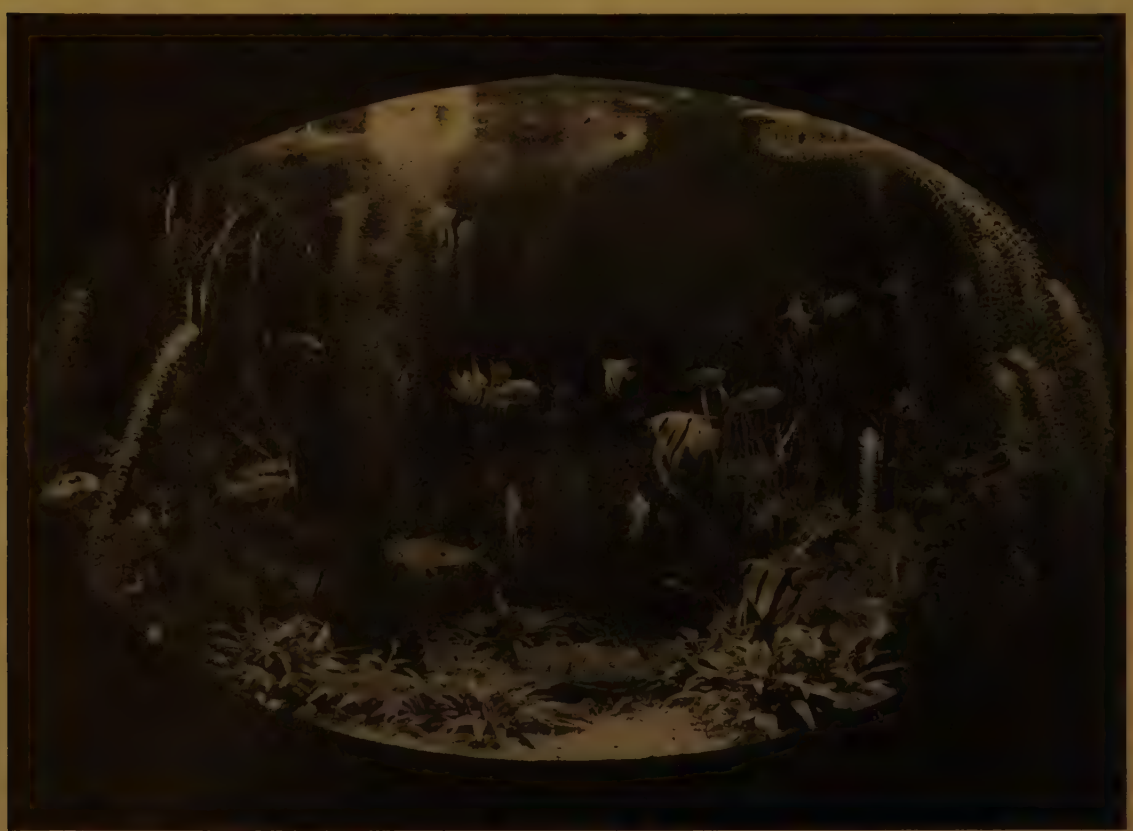
Full provision has now been made to employ fluorescent lights, as well as other kinds, in the new New York Aquarium that we are planning to build at Coney Island. – J.W.A.

Old Fish—New Tricks

(*Continued from Page* 26)

time seems to be very deeply ingrained in the fish and is probably one of the reasons why it survives as a species, inasmuch as it seems to have no other means of defense.

Our present specimens were put into a tank four feet long, well suited to their shape and general swimming activity, and they were fed with masses of Tubifex worms which they ate during the night. At least, the worms disappeared, although the fish were not seen for at least one

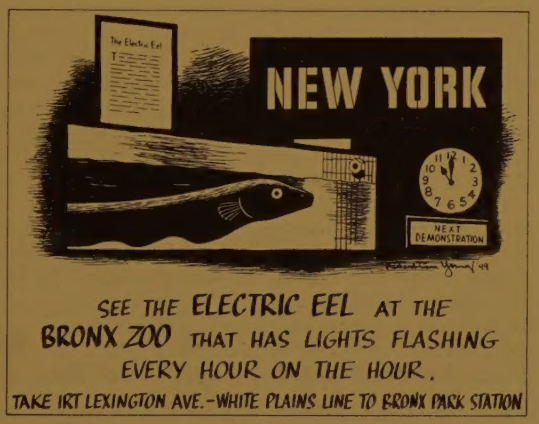


Both fishes and aquatic plants flourish under a new type of fluorescent lighting that has been applied to the Aquarium's tanks. Here a contented community of Scalares, Blue Gouramis, One-spot Characins and a freshwater Puffer lives among a luxurious growth of 5 kinds of aquatics.

The Zoo Goes Underground — In the Subway

Car cards prepared by the New York Subways Advertising Co. about special attractions at the Zoological Park have been displayed in the rapid transit systems of the city during the past year and three examples are shown here.

Although the Zoological Park has no way of knowing what proportion of its visitors are influenced by such means to come to the Zoo, the cards are undoubtedly a stimulus. The Boston Road, or subway, gate has always accounted for the major part of our attendance.


NEW YORK
NEXT DEMONSTRATION
SEE THE ELECTRIC EEL AT THE
BRONX ZOO THAT HAS LIGHTS FLASHING
EVERY HOUR ON THE HOUR.
TAKE IRT LEXINGTON AVE.-WHITE PLAINS LINE TO BRONX PARK STATION

month. Then they seemed to have become careless about their sleeping quarters, for they were observed simply lying on the surface of the sand.

At first we thought they might be sick or unhappy, but aside from simply lying at the surface of the sand they seemed to be quite all right. After another week or two they did not even take the trouble to sink to the bottom of the tank when they felt like sleeping; they simply turned on their sides and slept on any surface that would support them. At the present time they usually sleep on a mass of leaves of underwater plants, so that they are suspended in midwater.

This action would seem to be a complete negation of all their previous behavior and "instinctive" desire to be hidden during the daylight hours; it seems to be an important adjustment to the security of captivity, in which they have learned that they need not go to the labor of covering themselves.

[1] Some Notes on the Curious Behavior of Two Gymnotid Eels from South America. *Bulletin New York Zoological Society*, Vol. XXXVII, No. 2, 1934, pp. 59-61.

Our first Pere David's Deer fawn, born last April 10, is now showing the tiny buds of his first antlers.

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The Zoo's first birth in 1950 was a Nyala, born on January 4 in the African Plains Antelope House.

PUBLICATIONS OF INTEREST

HIGH JUNGLE, by William Beebe. xii, 1-379, 49 photographs, 1 map. Duell, Sloan and Pierce, New York, 1949. $4.50.

William Beebe's evident delight in returning to his first love — the jungle — after twenty years of diligent and productive work with the fishes and other animals of West Indian and Pacific islands and coral reefs, and with the weird and unseemly creatures of the deep-sea that he pursued with net and bathysphere, is manifested in every page of this fascinating volume. In the preface, Dr. Beebe states his credo: "To us, as naturalists, jungle is an epitome of beauty, comfort and intense interest." To those who have been fortunate enough to share the jungle with him, there will be no quibble as to this statement on any score; some of the acquainted and unacquainted might question the "comfort" of the jungle.

In his early British Guiana volumes, "Jungle Peace" and "Edge of the Jungle," Dr. Beebe devoted much attention to the smaller inhabitants of the great forests of South America. In "High Jungle," to our great enjoyment, the little creatures are back again in full force – the remarkable frogs Gawain and Guinevere of Guiana are supplanted by the Great Gray Frog whose obstetrical aptitudes include a long slit down its back from which emerged perfect little froglets! Amazing migrations of moths and butterflies and battles of giant beetles recall the wonderful Guiana stories of the behavior of army ants and the leaf-cutting or parasol ants.

Rancho Grande, the abandoned unfinished citadel high in the jungle-covered mountains of northern Venezuela, 60-odd miles west of the capital, Caracas, was the extremely adequate base from which Dr. Beebe and his staff attacked some of the innumerable biological problems that the jungle insistently laid at their doorstep. In "High Jungle" a few of the marvelous creatures that came before their microscopes, binoculars and telescopes are described and their habits placed before us in excellent photographs and splendid prose – the minute moth that built around its eggs a palisade made of its own body-scales; the fer-de-lances that dwelt in the deserted cul-de-sacs of Rancho Grande; the staff monkey used as a "taster" of insects to determine their edibility or inedibility and the relationship of their color or pattern to such inedibility; hummingbirds and their incredible aerial gyrations; the butterflies, moths and birds that unexplainedly migrated through the nearby pass of Portachuelo, to name but a few. To those who are interested in the more intense perceptions of sound and sight and taste and smell, William Beebe brings rich stimulation from the Venezuelan jungle. – JOHN TEE-VAN.

HAWKS ALOFT — THE STORY OF HAWK MOUNTAIN, by Maurice Broun. Dodd, Mead Co., New York, 1949. $4.00.

The story of Hawk Mountain is an epic of practical conservation that has few parallels. Since its success has stemmed largely from the determined application of Maurice Broun, Director of the Sanctuary, it is fitting that the first complete history of the undertaking should come from his pen.

It was a piece by Richard Pough, printed in *Bird Lore*, 1932, that first drew the attention of naturalists to the autumnal slaughter of migrating hawks, by "sportsmen" on a ridge called Blue Mountain, near Drehersville, Pa. Maurice Broun read that piece and so did Mrs. Rosalie Edge, redoubtable defender of wild life through her Emergency Conservation Committee. Two years later, their indignation found opportunity for practical expression. In October, 1933, Dick Pough learned that "Blue Mountain" could be purchased at a low figure. In August of the following year, Mrs. Edge obtained a lease of the property, with an option to purchase. Immediately, Maurice Broun was asked to act as "warden." He accepted and the ensuing fifteen years have justified the choice.

Hawk Mountain and the surrounding 1398 acres are now a sanctuary for all wild life, protected from gunners forever. Here the thrill of watching the autumnal passing of thousands of hawks answering the mysterious urge that activates migration is experienced by hundreds of fascinated onlookers. No one who has sat upon the craggy summit and watched that swift and silent passing can remain unmoved.

Mr. Broun's book is a monument to conservation at work. Also, it will act as a stimulant to further effort in related fields. – LEE S. CRANDALL.

AN ILLUSTRATED KEY TO THE LIZARDS, SNAKES AND TURTLES OF THE WEST. By Jay M. Savage. 32 pp., 176 figures, 7 map plates, references. Vol. 2, Naturegraph Pocket Keys. Naturegraph Company, Los Altos, California, 1949. 50¢.

A simple, well-illustrated tabloid key to reptiles found west of the Rockies. Designed primarily for amateurs. Unfortunately it employs the binomial rather than the more modern trinomial system of classification, contains several technical errors and lacks an index. Nevertheless, its brevity, range maps and apt sketches commend it for general field use. – BRAYTON EDDY.

New Members of the New York Zoological Society

(Between November 1 and December 31)

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Volume I, Nos. 1 and 2

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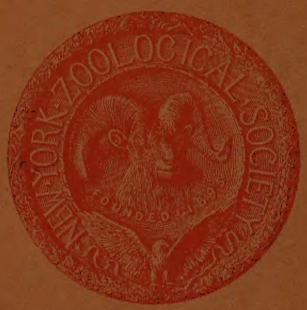
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